Exhibit 5

Exhibit 7 - U.S. Patent No. 8,891,347 ("'347 Patent")

Accused Instrumentalities: (1) cellular base stations that support 3GPP 5G NR beamforming, and (2) cellular handsets that support 3GPP 5G NR beamforming, including without limitation the Apple iPhone 12, iPhone 12 mini, iPhone 12 Pro, iPhone 12 Pro Max, iPhone 13, iPhone 13 mini, iPhone 13 Pro, iPhone 13 Pro Max, iPhone 14, iPhone 14 Plus, iPhone 14 Pro, and iPhone 14 Pro Max and Samsung Galaxy S20 FE, Galaxy S21, Galaxy S21 FE, Galaxy S21 Ultra, Galaxy S22, Galaxy S22+, Galaxy S22 Ultra, Galaxy Z Flip3, Galaxy Z Flip4, Galaxy Z Fold3, Galaxy Z Fold4, Galaxy A52, Galaxy A53, and all versions and variations thereof since the issuance of the asserted patent.

Claim 1

Claim 1	Public Documentation
[1pre] A method for wireless communication in a system including a transmitter, a receiver, and a plurality of propagation paths formed between the transmitter and the receiver which are capable of carrying a signal transmitted by the transmitter to the receiver, the method comprising:	To the extent the preamble is found to be limiting, the Accused Instrumentalities perform a method for wireless communication in a system including a transmitter, a receiver, and a plurality of propagation paths formed between the transmitter and the receiver which are capable of carrying a signal transmitted by the transmitter to the receiver. For example, the Accused Instrumentalities perform a method for beamforming 5G NR transmissions between a base station and user equipment (UE) such as an iPhone handset, utilizing the multipath transmission environment between the transmitter and receiver. This method is described, for example, in 3GPP standards documents such as TR 38.901 V15.0.0, TS 38.300 V2.0.0, and associated documents, which describe aspects of the operations associated with components of the Accused Instrumentalities. **4.1 Overall Architecture** An NG-RAN node is either: - a gNB, providing NR user plane and control plane protocol terminations towards the UE; or - an ng-eNB, providing E-UTRA user plane and control plane protocol terminations towards the UE. The gNBs and ng-eNBs are interconnected with each other by means of the Xn interface. The gNBs and ng-eNBs are also connected by means of the NG interfaces to the 5GC, more specifically to the AMF (Access and Mobility Management Function) by means of the NG-C interface and to the UPF (User Plane Function) by means of the NG-U interface (see TS 23.501 [3]). NOTE: The architecture and the F1 interface for a functional split are defined in TS 38.401 [4].

Claim 1	Public Documentation

The NG-RAN architecture is illustrated in Figure 4.1-1 below.

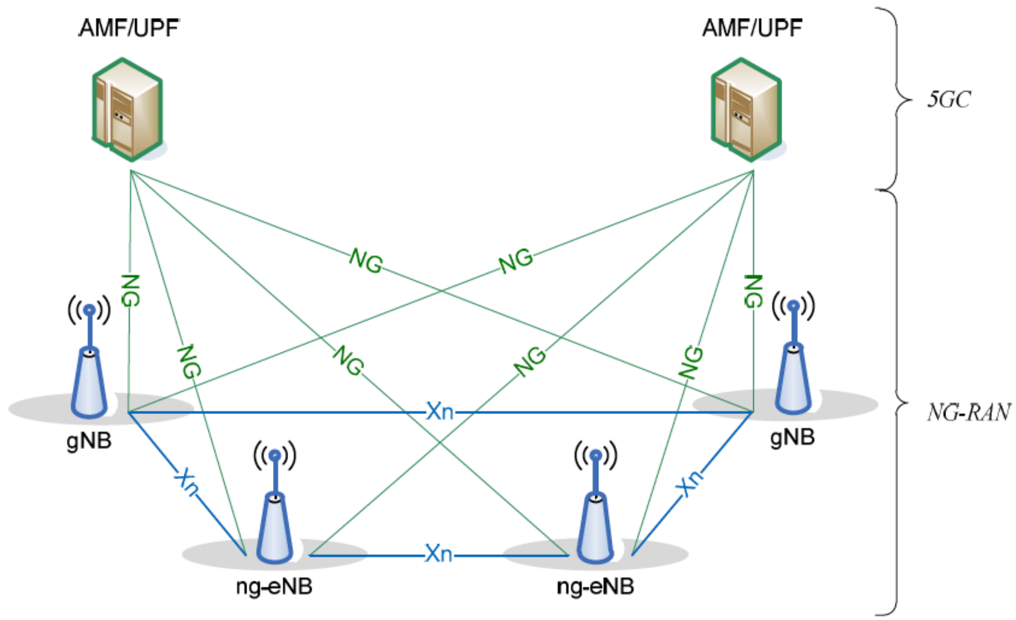


Figure 4.1-1: Overall Architecture

(3GPP TS 38.300 v17.2.0, § 4.1)

LCS	Local Coordinate System
LOS	Line Of Sight
MIMO	Multiple-Input-Multiple-Output
MPC	Multipath Component
NLOS	Non-LOS

(3GPP TR 38.901 v15.0.0, § 3.2)

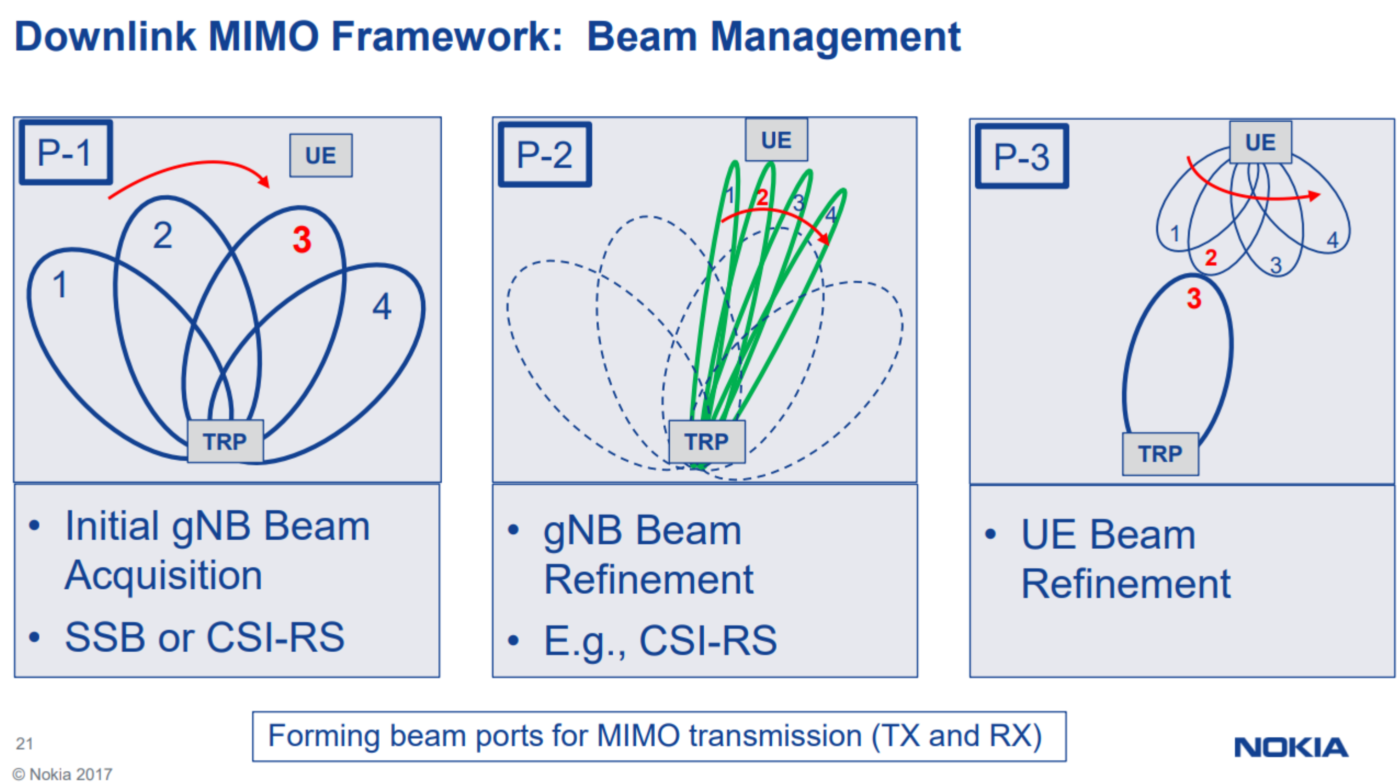
Claim 1	Public Documentation
	4. The number of rays per cluster shall be calculated as follows: $$M = \min\{\max(M_t M_{AOD} M_{ZOD}, 20), M_{\max}\} \quad (7.6\text{-}8)$$ where: - $M_t = \lceil 4kc_{DS}B \rceil$ - $M_{AOD} = \left\lceil 4kc_{ASD} \frac{\pi \cdot D_h}{180 \cdot \lambda} \right\rceil$ - $M_{ZOD} = \left\lceil 4kc_{ZSD} \frac{\pi \cdot D_v}{180 \cdot \lambda} \right\rceil$ - $M_{\max}$ is the upper limit of M, and it should be selected by the user of channel model based on the trade-off between simulation complexity and accuracy. - D_h and D_v are the array size in m in horizontal and vertical dimension, B is bandwidth in Hz, c_{ASD} and c_{ZSD} are the cluster spreads in degrees, and λ is the wavelength. - k is a "sparseness" parameter with value 0.5. It is noted that each MPC may have different AOD, ZOD, and delay. (3GPP TR 38.901 v15.0.0, § 7.6.2.2)

Claim 1	Public Documentation
	Table 7.8-4: Simulation assumptions for calibration for large bandwidth and large antenna array (see table below) (3GPP TR 38.901 v15.0.0, Table 7.8-4)

Parameter	Values
Scenarios	UMi-street Canyon
Carrier Frequency	30GHz
Bandwidth	2GHz
BS antenna configurations	M = 8, N = 8, P = 2, M_g = 1, N_g = 4, d_H = d_V = 0.5λ, $d_{H,g}$ = $d_{V,g}$ = 4λ
BS port mapping	all 64 elements for each polarization on each panel are mapped to a single CRS port; panning angles of the two subarrays: (0,0) degs; same downtilt angles as used for the large-scale calibrations
The number of rays per cluster	N_{MPC} = 40
Calibration method	Drop multiple users in the multiple cells randomly, and collect the following metrics for each user after attachment.
Metrics	1) CDF of coupling loss (serving cell) 2) Wideband SINR before receiver – determined from RSRP (formula) from CRS port 0 3) CDF of largest (1^{st}) PRB singular values (serving cell) at t=0 plotted in 10*log10 scale

<table>
<tr><th>Claim 1</th><th>Public Documentation</th></tr>
<tr><td>[1a] transmitting a first signal from the transmitter to the receiver via a first propagation path of the plurality of propagation paths;</td><td>The Accused Instrumentalities perform a method including transmitting a first signal from the transmitter to the receiver via a first propagation path of the plurality of propagation paths.

For example, the base station initially transmits via a narrow-beam antenna to the UE. This is illustrated in the diagrams below as, for example and without limitation, the initial gNB beam (which is one of the plurality of propagation paths).



(5G New Radio (NR) : Physical Layer Overview and Performance IEEE Communication Theory Workshop - 2018 Amitabha Ghosh, Nokia Fellow and Head, Radio Interface Group Nokia Bell Labs, May 15th, 2018, at 21)</td></tr>
<tr><td>[1b] receiving the first signal at the receiver;</td><td>The Accused Instrumentalities perform a method including receiving the first signal at the receiver.

For example, the UE, such as the non-limiting example of an iPhone, receives the initial transmission as described above and below.</td></tr>
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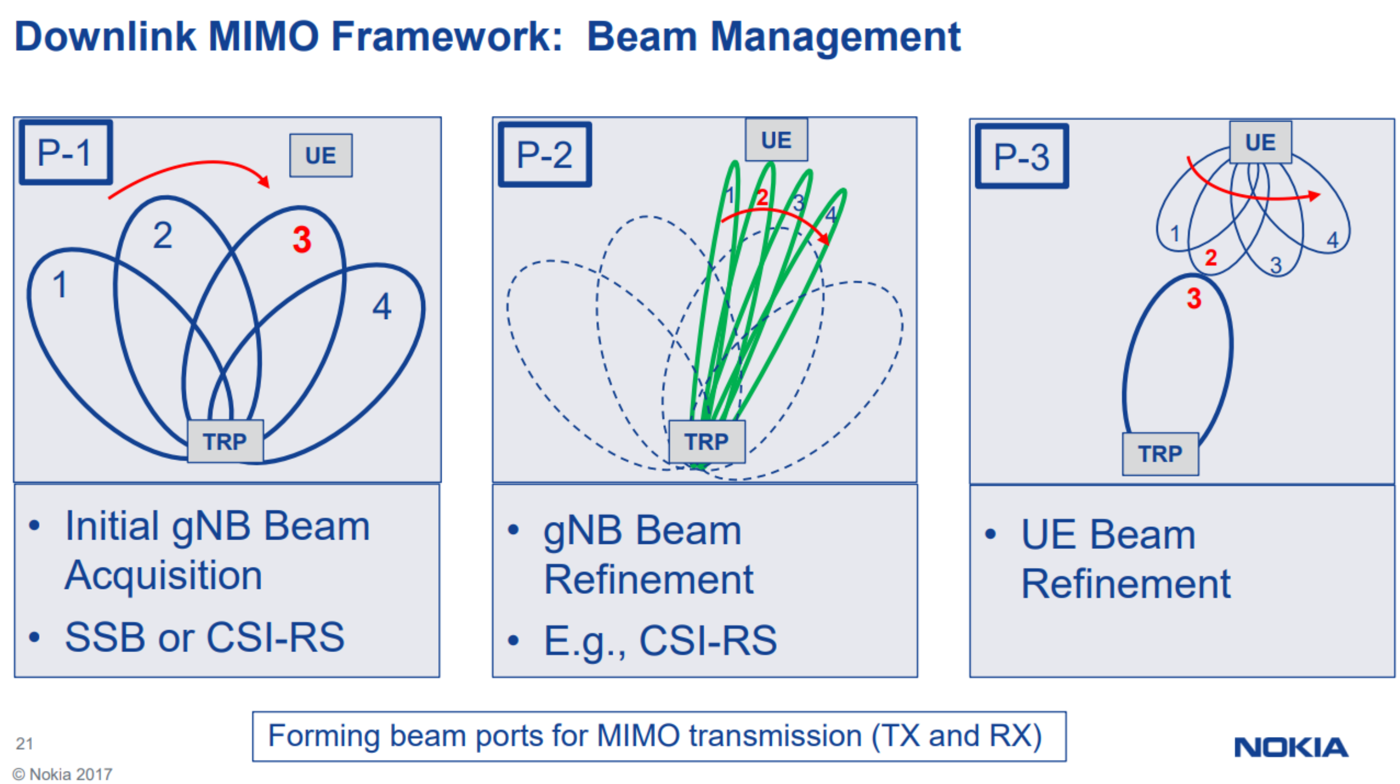
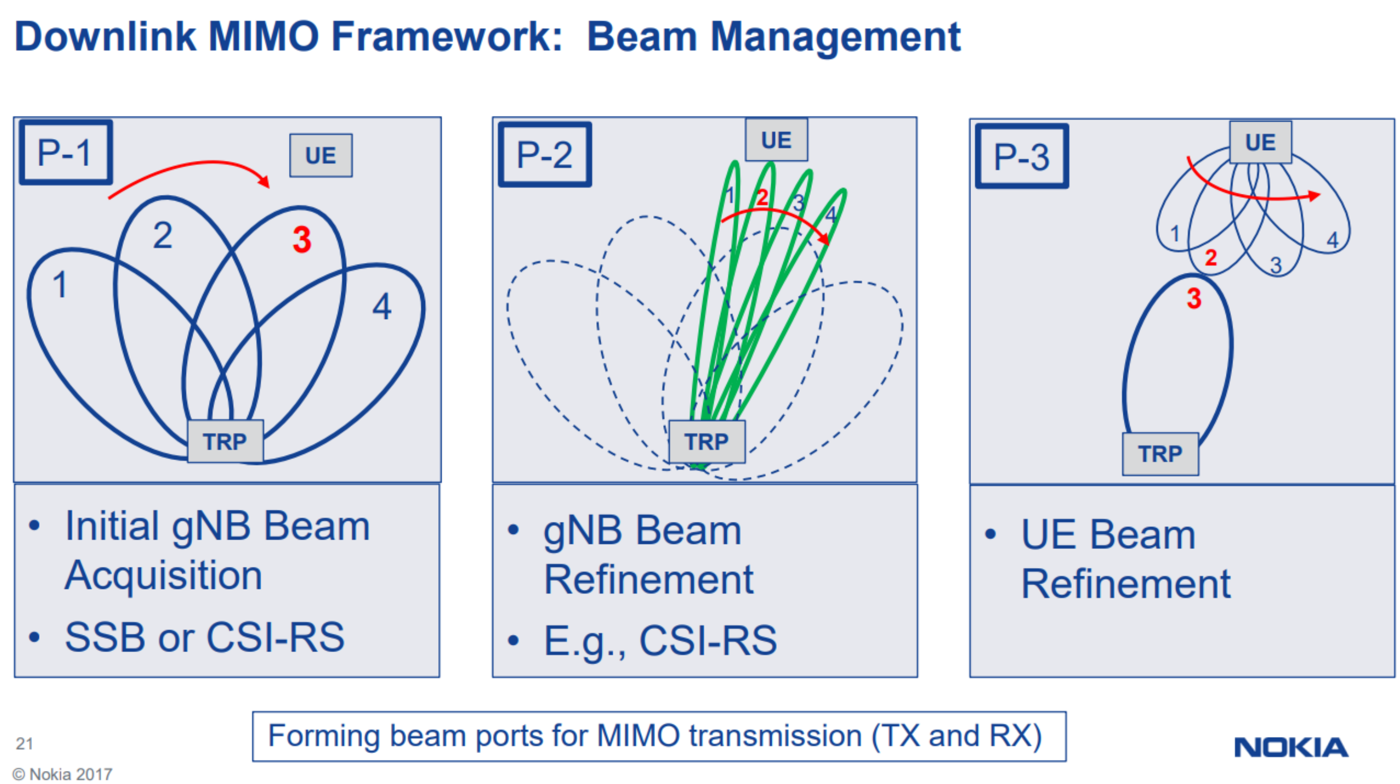
<tr><th>Claim 1</th><th>Public Documentation</th></tr>
<tr><td></td><td>

(5G New Radio (NR) : Physical Layer Overview and Performance IEEE Communication Theory Workshop - 2018 Amitabha Ghosh, Nokia Fellow and Head, Radio Interface Group Nokia Bell Labs, May 15th, 2018, at 21)</td></tr>
<tr><td>[1c] performing a channel estimation based on the first signal to obtain path parameter information of the first propagation path;</td><td>The Accused Instrumentalities perform a method including performing a channel estimation based on the first signal to obtain path parameter information of the first propagation path.

For example, the UE performs link channel state estimation based on the first signal, which includes information that is required by the gNB.</td></tr>
</table>

Claim 1	Public Documentation
	5.2.5 Physical layer procedures **5.2.5.1 Link adaptation** Link adaptation (AMC: adaptive modulation and coding) with various modulation schemes and channel coding rates is applied to the PDSCH. The same coding and modulation is applied to all groups of resource blocks belonging to the same L2 PDU scheduled to one user within one TTI and within a MIMO codeword. For channel state estimation purposes, the UE may be configured to measure CSI-RS and estimate the downlink channel state based on the CSI-RS measurements. The UE feeds the estimated channel state back to the gNB to be used in link adaptation. (3GPP TS 38.200 v2.0.0, § 5.2.5.1)
[1d] sending the channel estimation that includes the path parameter information from the receiver to the transmitter via the first propagation path;	The Accused Instrumentalities perform a method including sending the channel estimation that includes the path parameter information from the receiver to the transmitter via the first propagation path. For example, the UE sends the estimated channel state back to the gNB. In at least TDD mode (as used by 5G NR FR2 with beamforming), the uplink transmission uses the same propagation path (via reciprocity) as the downlink transmission. **5.2.5 Physical layer procedures** **5.2.5.1 Link adaptation** Link adaptation (AMC: adaptive modulation and coding) with various modulation schemes and channel coding rates is applied to the PDSCH. The same coding and modulation is applied to all groups of resource blocks belonging to the same L2 PDU scheduled to one user within one TTI and within a MIMO codeword. For channel state estimation purposes, the UE may be configured to measure CSI-RS and estimate the downlink channel state based on the CSI-RS measurements. The UE feeds the estimated channel state back to the gNB to be used in link adaptation. (3GPP TS 38.200 v2.0.0, § 5.2.5.1)

[1e] predistorting a second signal at the transmitter in a time domain, a frequency domain, and a spatial domain, according to the channel estimation based on the first signal;	The Accused Instrumentalities perform a method including predistorting a second signal at the transmitter in a time domain, a frequency domain, and a spatial domain, according to the channel estimation based on the first signal. For example, a 5G NR signal with beamforming is a predistorted signal in time, frequency, and space. For example, applicable time and frequency subcarriers are selected based on the returned CSI, and an appropriate spatial beam refinement is selected based on the returned CSI.



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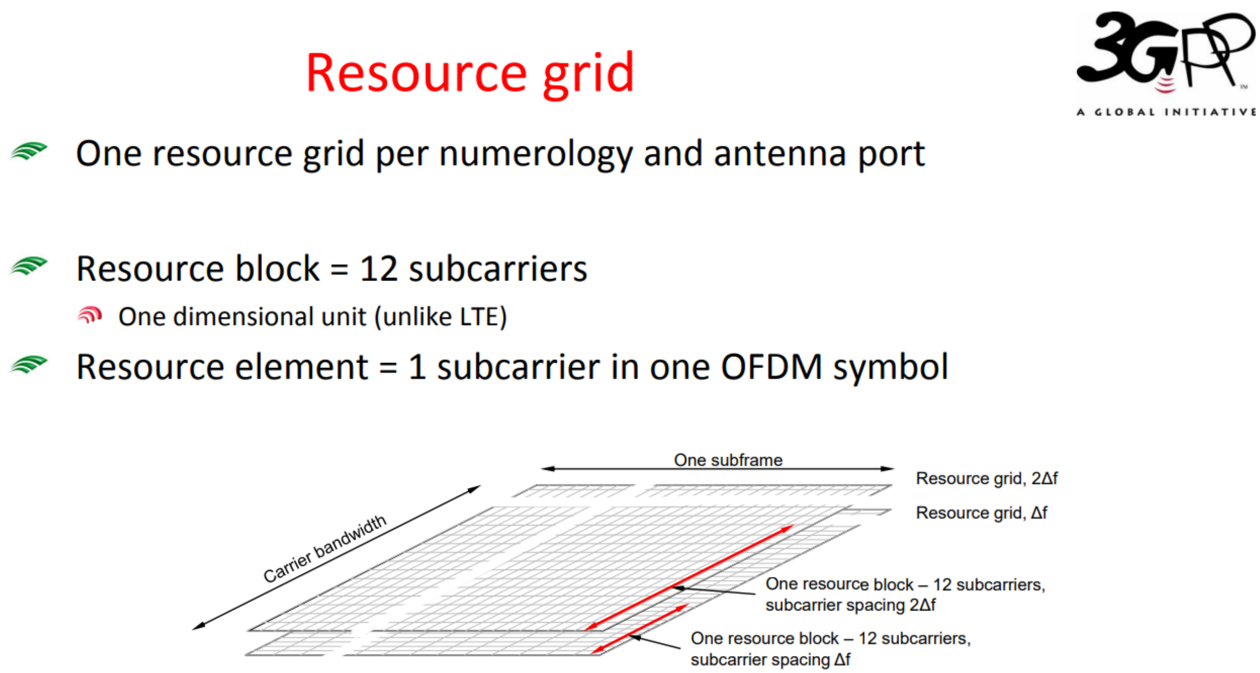
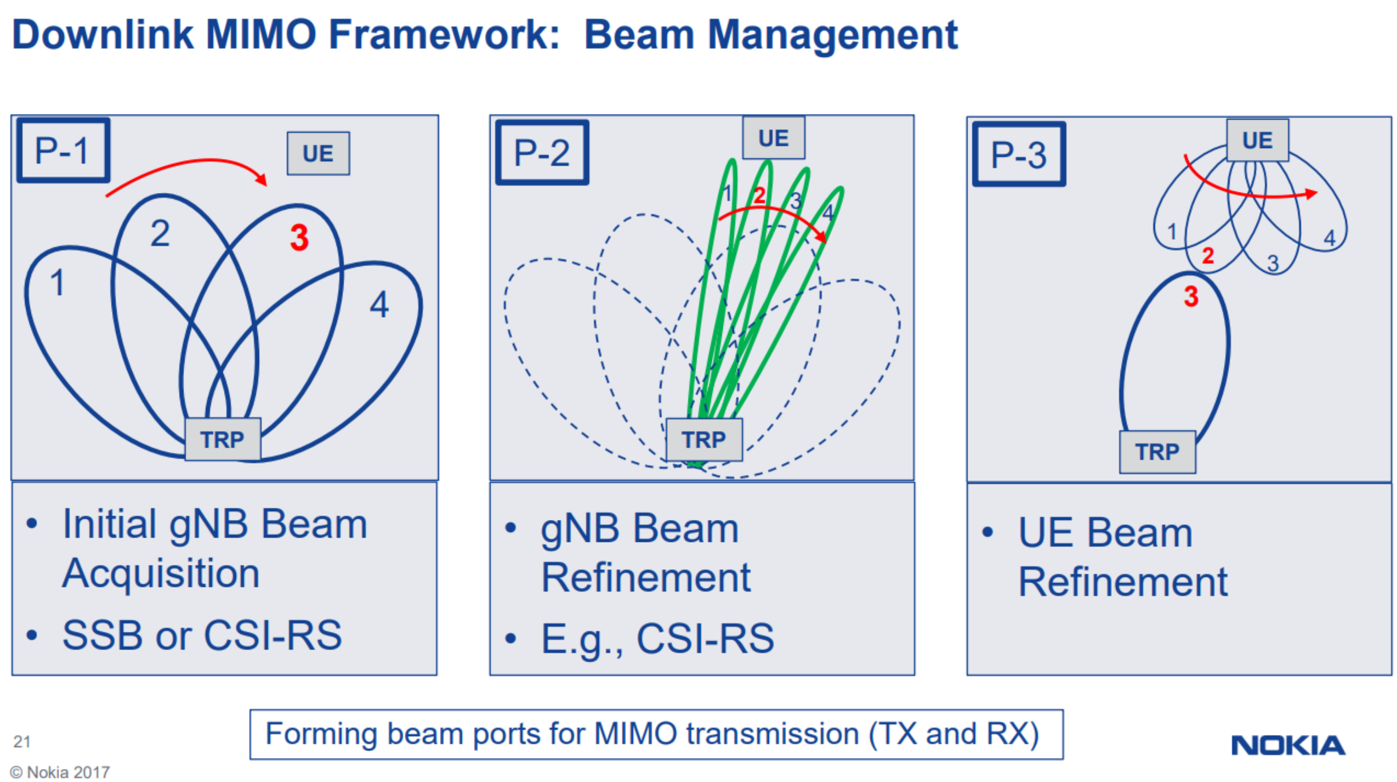
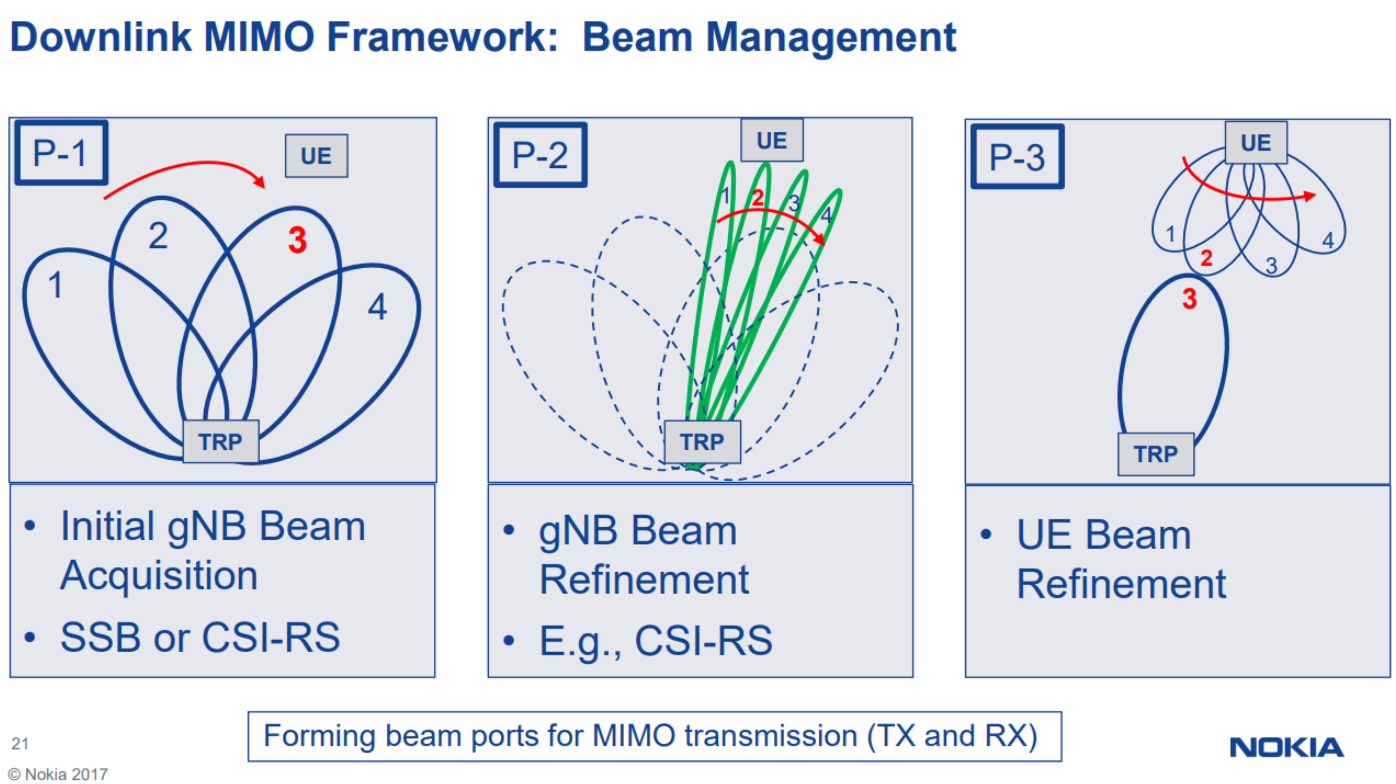
Claim 1	Public Documentation
	 (NR Physical Layer Design: Physical layer structure, numerology and frame structure Workshop on 3GPP submission towards IMT-2020, Brussels, Oct. 24-25, 2018, Havish Koorapaty 3GPP TSG RAN WG1 vice-chairman (Ericsson), available at https://www.3g4g.co.uk/5G/5Gtech_4001_3GPP_5GNR_IMT2020_EvaluationWorkshop_Oct2018/RWS-180007_3GPP%20NR%20Physical%20Layer%20Structure%20IMT2020.pdf). In this illustration, a resource block is placed in a particular subframe (by time) and resource block (by frequency, i.e. subcarriers).

Claim 1	Public Documentation
[1f] transmitting the predistorted second signal from the transmitter to the receiver via the first propagation path; and	The Accused Instrumentalities perform a method including transmitting the predistorted second signal from the transmitter to the receiver via the first propagation path. For example, the gNB transmits the beamformed signal as described in the previous element.  (5G New Radio (NR) : Physical Layer Overview and Performance IEEE Communication Theory Workshop - 2018 Amitabha Ghosh, Nokia Fellow and Head, Radio Interface Group Nokia Bell Labs, May 15th, 2018, at 21)

Claim 1	Public Documentation
[1g] receiving the predistorted second signal at the receiver.	The Accused Instrumentalities perform a method including receiving the predistorted second signal at the receiver. For example, the UE receives the beamformed signal as described in the previous two elements.  (5G New Radio (NR) : Physical Layer Overview and Performance IEEE Communication Theory Workshop - 2018 Amitabha Ghosh, Nokia Fellow and Head, Radio Interface Group Nokia Bell Labs, May 15th, 2018, at 21)